35t FEMB Status and Noise

20160217 - BNL DUNE - B.Kirby

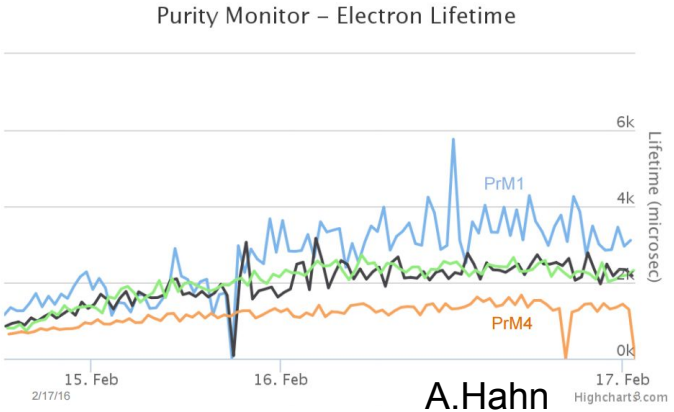
Overview

- LAr pumps now working
- 16 FEMBs still operating in 35t cryostat
- FEMB channel noise increased following cooldown, but were still marginally acceptable (< 3000e- ENC, better when correlated noise removed)
- Noise has significantly increased over time
  - Wire-bias ramp up caused very high noise levels, ~20000e- ENC
    - Noise persisted after wire-bias shut down
  - Noise levels increased again Friday evening, cause is not clear
- Persistent ADC sampling problem for 4 ASICs on RCE03 and RCE14
  - Needs debugging, but noise is more pressing problem

Cryo Status - 2/17/16

- Both 35 ton Recirculation pumps were “broken free” last Thursday 2/11. We are running on pump B. Yeah!…
- The Liquid Argon recirculation path from 35t through the filters was then established and we began purifying in earnest 2/11 at 17:00.
- Purification is going nicely – see Alan’s PRM plots.
- Liquid level in 35t dropped 1.5” or 100 gallons due to filling filters plus a tiny bit from analyzer use.
- Monday 2/15, ~9 am started sending a small amount of LAPD gas into the filtration stream to increase the 35t cryostat level. Rate of level increase is 0.3” per day. Will go until this Friday.

e^- lifetimes last 48 hrs



A.Hahn

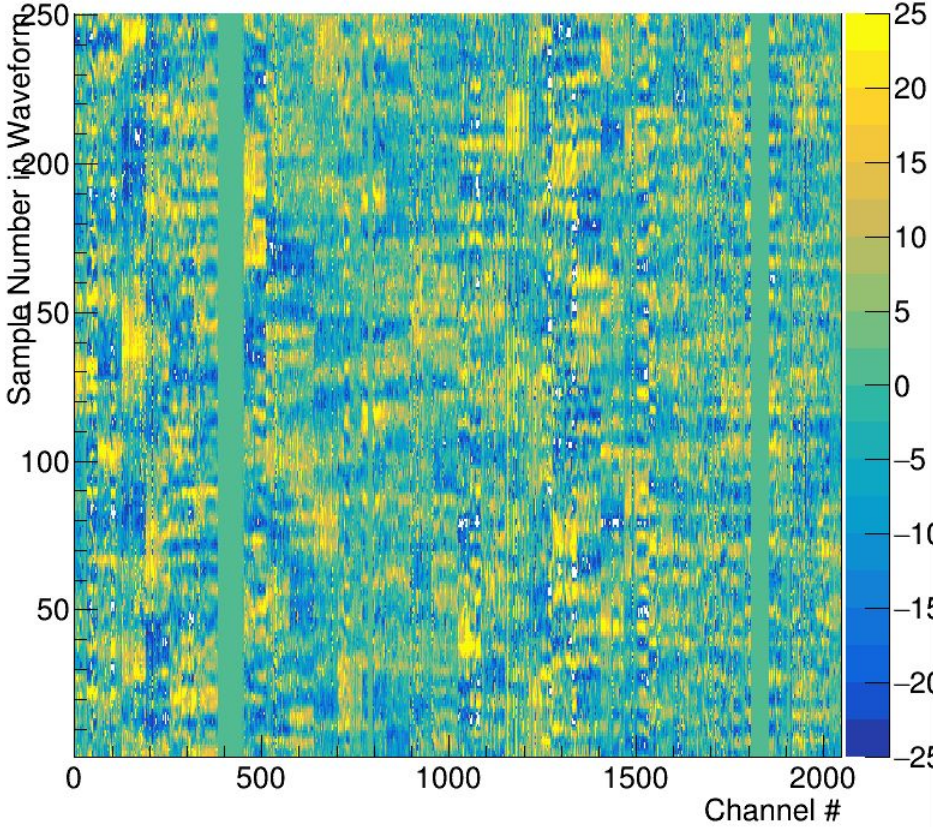
Noise Measurements over Time (No Subtraction)

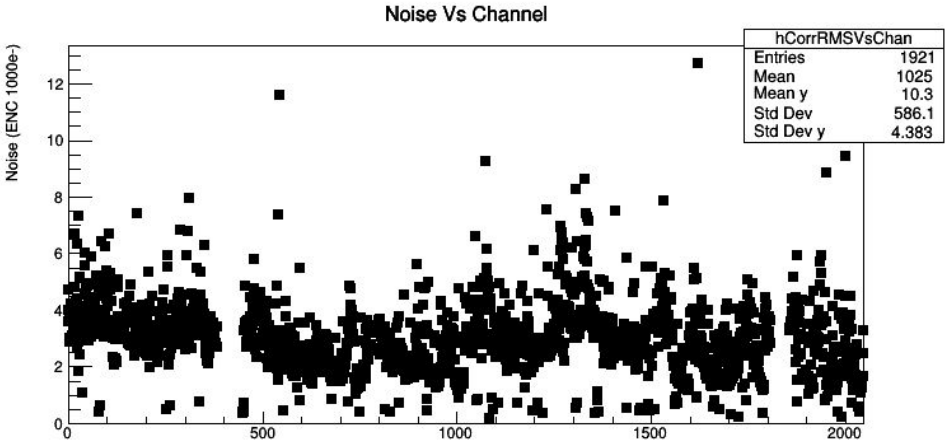
Run	Date	System State	Mean Collection Wire Noise (ENC e-)	Mean Induction Wire Noise (ENC e-)
10149	Feb 5	Post-cooldown (35t filled Feb 2)	2600	3100
10195	Feb 5	Wire-bias ramped	21000	22000
10400	Feb 8	Wire-bias + drift on, wire-bias “trick”	2860	3090
10788	Feb 11	Wire-bias + drift on, LAr pumps off	2770	3050
10852	Feb 11	Wire-bias on, drift off, LAr pumps on	3050	4450
10895	Feb 12	Wire-bias + drift on, LAr pumps on	3050	4560
11027	Feb 13	Wire-bias + drift on, LAr pumps on	6020	8090
11387	Feb 16	Wire-bias + drift off, LAr pumps on	11280	16600

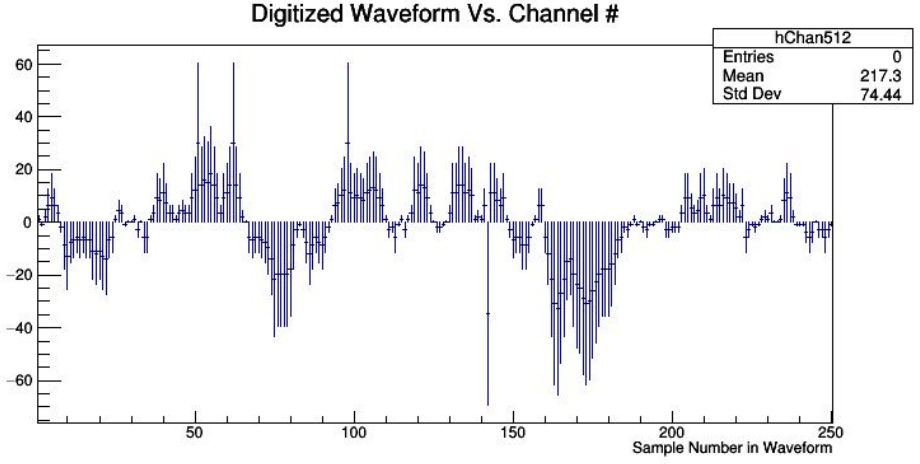
Amplifier Oscillation + Wire-Bias “Trick”

- On initial wire-bias ramp up, found channel noise greatly increased
  - High noise persisted even after wire-bias ramped down
- Trick identified to reduce noise to “acceptable level” with wire-bias on
  - Ramp wire bias to +50V above nominal values
  - Ramp wire bias to nominal value at 10V/s
  - Generally see noise reduced after ramp down to nominal
- Speculation: fast ramp-down is inducing a transient signal on FE-ASIC channel inputs that temporarily saturate amplifiers, disrupt oscillation
  - Will request to just power-cycle ASICs

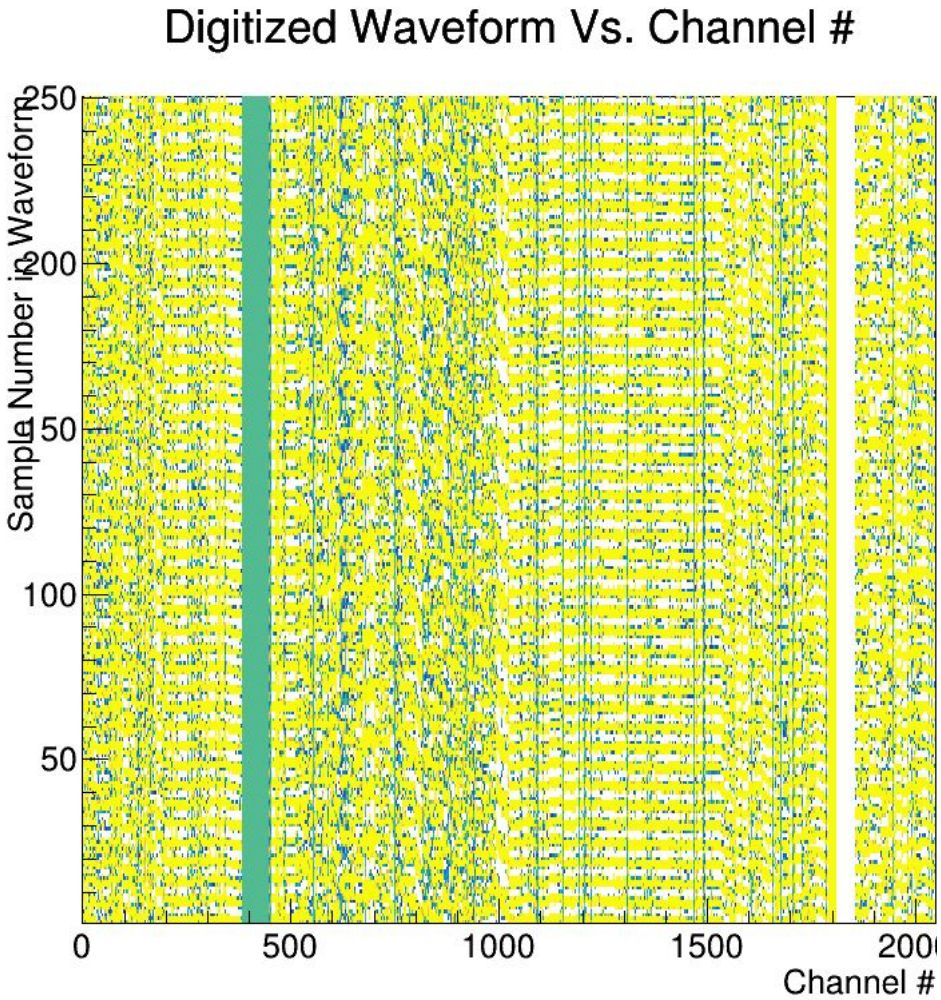
Run 10119 - 7.8mV/fC, 2us : before wire-bias ramp

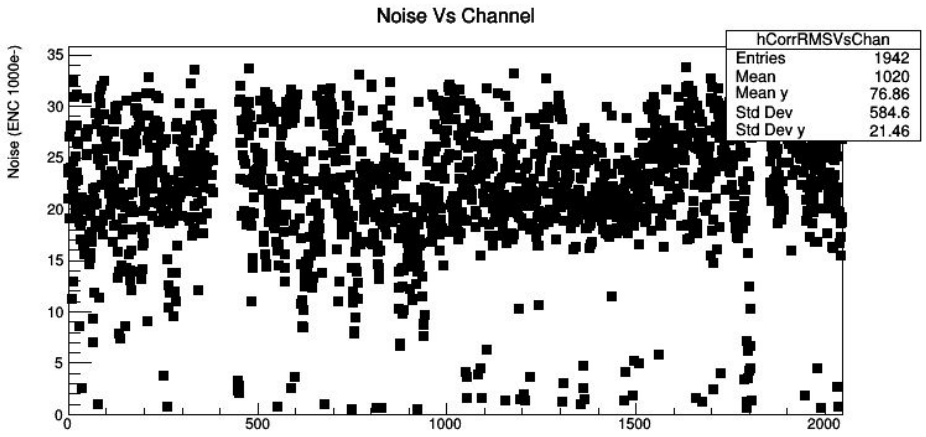


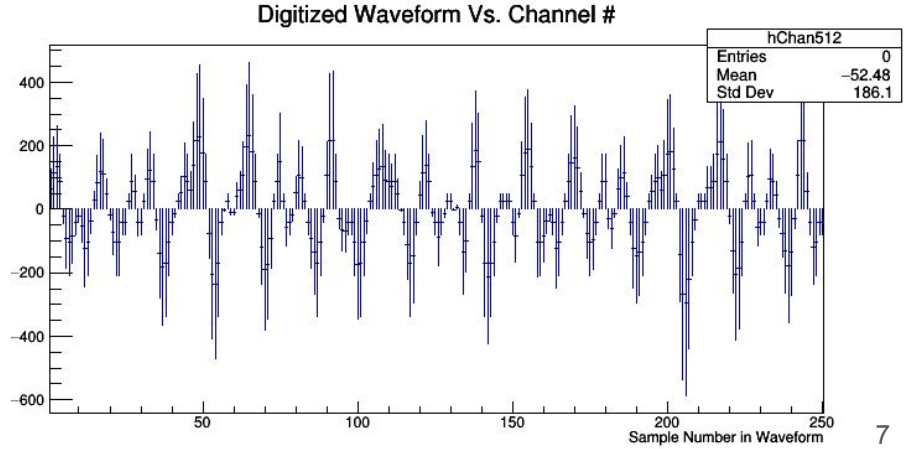




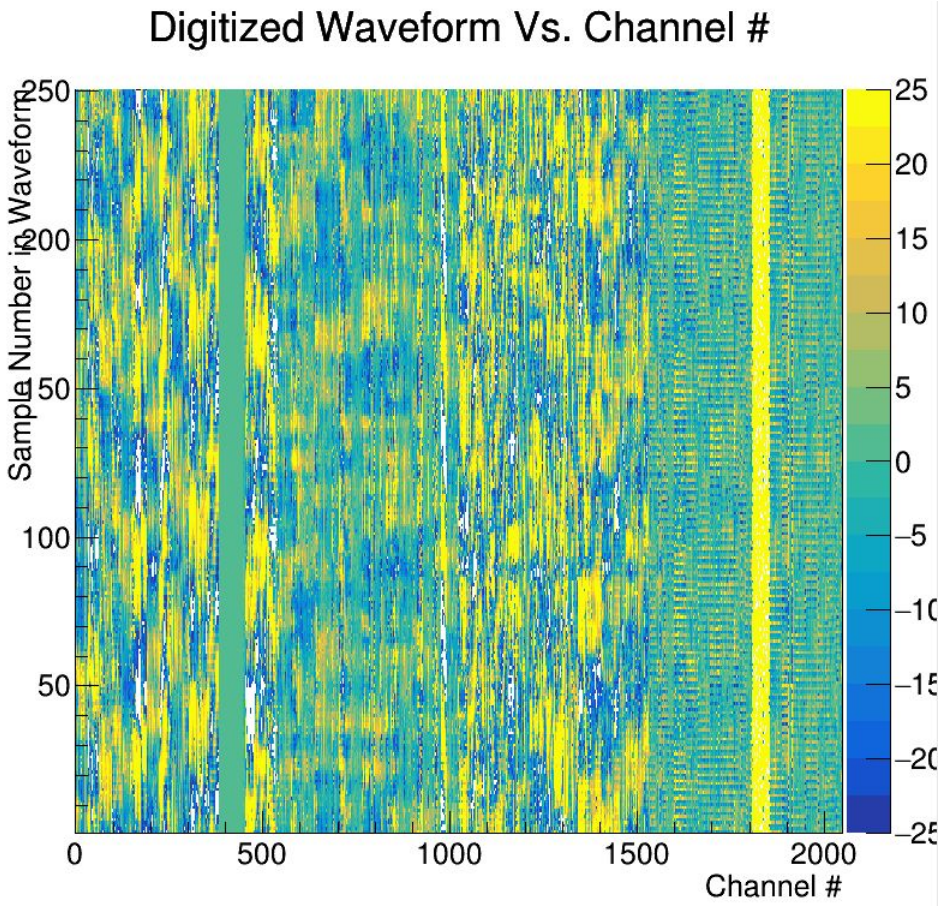
Run 10195 - very high noise after wire-bias ramped up

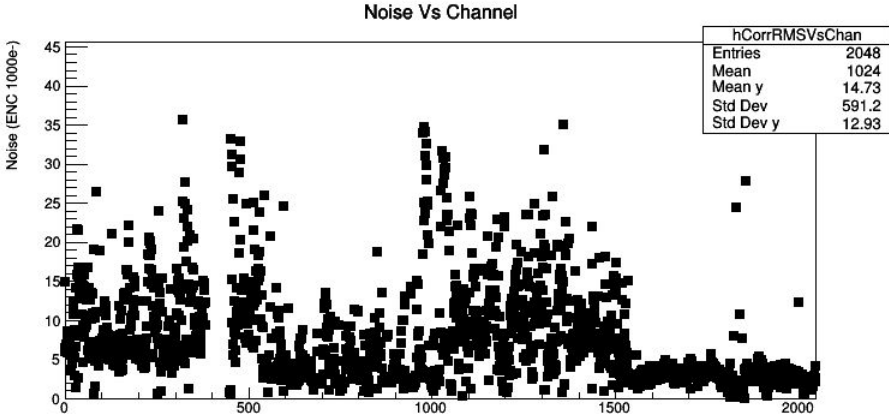


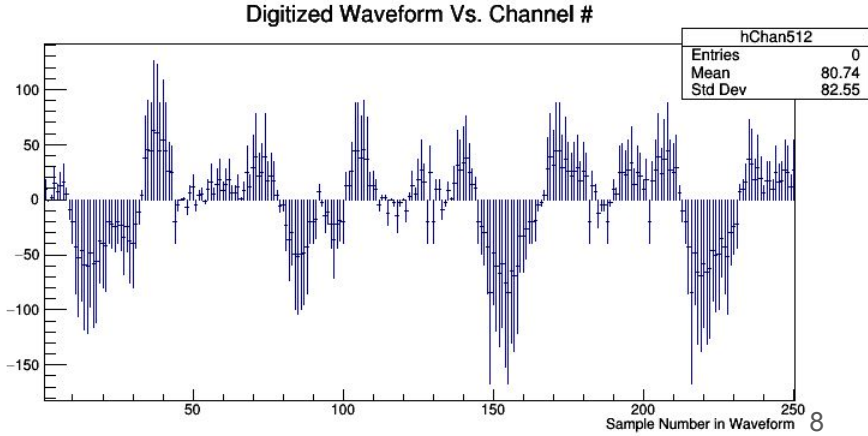




Run 11027 - wire-bias + drift field + LAr pumps on







Summary

- Top 35t cold electronics priority: debug FEMB noise
  - Try to get noise to an “acceptable” level (<3000e- ENC) ie. post-cooldown state
  - Need to investigate wire-bias supply further, high noise levels started with wire-bias ramping
    - Wire-bias was ramped at room temperature without obvious noise increase